

Study on the Mechanical Properties of Bamboo Fiber-Reinforced Polypropylene Based Composites: Effect of Gamma Radiation

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Abstract : Bamboo fiber (BF) reinforced polypropylene (PP) based composites were fabricated by a conventional compression molding technique. In this investigation, bamboo composites were manufactured using different percentages of fiber, which were varying from 25-65% on the total weight of the composites. To fabricate the BF/PP composites untreated and treated fibers were selected. A systematic study was done to observe the physical, mechanical, and interfacial behavior of the composites. In this study, mechanical properties of the composites such as tensile, impact, and bending properties were observed precisely. Maximum tensile strength (TS) and bending strength (BS) were found for 50 wt% fiber composites, 65 MPa, and 85.5 MPa respectively, whereas the highest tensile modulus (TM) and bending modulus (BM) was examined, 5.73 GPa and 7.85 GPa respectively. The BF/PP based composites were treated with irradiated under gamma radiation (the source strength 50 kCi Cobalt-60) of various doses (i.e. 10, 20, 30, 40, 50 and 60 kGy doses). The effect of gamma radiation on the composites was also investigated, and it found that the effect of 30.0 kGy (i.e. units for radiation measurement is 'gray', kGy=kilogray) gamma dose showed better mechanical properties than other doses. After flexural testing, fracture sides of the untreated and treated both composites were studied by scanning electron microscope (SEM). SEM results of the treated BF/PP based composites showed better fiber-matrix adhesion and interfacial bonding than untreated BF/PP based composites. Water uptake and soil degradation tests of untreated and treated composites were also investigated.

Keywords : bamboo fiber, polypropylene, compression molding technique, gamma radiation, mechanical properties, scanning electron microscope

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